# Management of Colon Perforation Following Percutaneous Nephrolithotomy

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**Abstract**

**Introduction and Objectives.** In the EAU guidelines the percutaneous nephrolithotomy (PCNL) is the main indication for kidney stones with dimensions over 2 cm. Early recognition of the colonic perforation an important step in limiting an infection that can lead to subsequent sequelae The objectives of this study is to evaluate the cases in which colonic perforation has occurred, both in terms of possible favoring factors and from the perspective of the treatment applied and of the subsequent evolution of the patient.

**Material and Methods.** Between January 2009 and January 2019 we performed 1394 PCNL interventions. All patients were operated in prone position. We analyzed the cases in which the colonic perforation appeared. Positive diagnosis was made after computerized tomography. We took into account the patients' age, sex, previous surgical history, body mass index, time to diagnosis of colonic perforation, type of treatment applied in this complication, length of hospitalization as well as case evaluation at 6 weeks and 6 months, respectively.

**Results.** Of the 1394 patients in whom we performed PCNL, colonic perforation appeared in 4 of them, all female patients. A conservative treatment was applied to all patients. In patients with colonic fistula on the left side, healing was done without complications. In the patient with colonic fistula on the right side at 4 days postoperatively, surgery was required which resulted in the right colectomy. The ureteral stent was suppressed in all patients 6 weeks after discharge. The control at 6 weeks and at 6 months revealed a kidney without lithiasis, sterile urine culture or sequelae of the colonic fistula.

**Conclusion.** Colon perforation is a severe complication after PCNL. Factors favoring these complications should be recognized preoperatively and thus the risk of colonic perforation can be reduced. Conservative treatment can be applied especially in cases where colonic perforation occurs following a PCNL performed on the left side.

**Key-words:** colectomy, colon perforation, conservative treatment, PCNL

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## Introduction and Objectives

In the era of minimally invasive endoscopic urological surgery the tendency to use percutaneous nephrolithotomy (PCNL) is becoming less and less popular. This is due to the higher intraoperative and postoperative risks of PCNL compared to retrograde flexible ureteroscopy (RIRS) or extracorporeal shock wave lithotripsy (ESWL).

However, in the EAU guidelines the PCNL is the main indication for kidney stones with dimensions over 2 cm. Only if the PCNL is not available in the respective department can the ESWL or flexible ureteroscopy be used for stones over 2 cm.

In the case of stones with a size of less than 2 cm located at the level of the renal pelvis, inferior or superior calyx treatment options as ESWL, flexible ureteroscopy or PCNL can be taken into consideration [1].

The incidence of different types of post NLP complications is relatively reduce. The most common are fever (10-20% of cases) and blood transfusions (7-10%) [2]. Severe post-NLP complications may occur in 1-2% of patients and are represented by chest involvement 1.5%, sepsis 0.5%, embolism and organ damage 0.4%, urinoma 0.4%, and death 0, 05% [3].

The management of these severe complications is often complex and requires significant financial resources [4].

Early recognition of the colonic perforation an important step in limiting an infection that can lead to subsequent sequelae. The appearance of fever, signs of peritoneal irritation, externalization of faeces on the nephrostomy pathway, postoperative diarrhea are important data signals for the suspicion of colonic perforation.

Contrast computer tomography is the gold standard for recognizing this complication.

The insertion of an ureteral stent and a bladder catheterization should be performed in these cases [5]. Later the treatment of colonic perforation may be conservative, colostomy or even colectomy may be performed in severe cases.

The objectives of this study is to evaluate the cases in which colonic perforation has occurred, both in terms of possible favoring factors and from the perspective of the treatment applied and of the subsequent evolution of the patient.

## Material and Methods

Between January 2009 and January 2019 we performed 1394 PCNL interventions. All patients were operated in prone position. At the end of the intervention, a Foley-type nephrostomy was inserted, which was suppressed on average 48 hours postoperatively. During the hospitalization all patients received prophylactic antibiotic treatment.

We analyzed the cases in which the colonic perforation appeared. Positive diagnosis was made after computerized tomography.

We took into account the patients' age, sex, previous surgical history, body mass index (BMI), time to diagnosis of colonic perforation, type of treatment applied in this complication, length of hospitalization as well as case evaluation at 6 weeks and 6 months, respectively.

## Results

Of the 1394 patients in whom we performed PCNL, colonic perforation appeared in 4 of them. All patients were female. The analysis of the group of patients entered in the study is presented in Table 1.

Table 1. Analysis of the study group

| | Patient 1 | Patient 2 | Patient 3 | Patient 4 |
|---|---|---|---|---|
| Age | 56 | 38 | 67 | 49 |
| Sex | Female | Female | Female | Female |
| Surgical history | no | no | yes | yes |
| Body mass index (BMI kg/m) | 18 | 16,5 | 28,3 | 26,4 |
| Left/Right PCNL | Left | Left | Right | Left |

In 3 patients the diagnosis was made about 48 hours postoperatively, after the suppression of nephrostomy and externalization of faeces at the level of the nephrostomy pathway. In 1 patient the diagnosis was made less than 48 hours due to signs of peritoneal irritation. In all patients, the tomographic examination showed a colonic lesion. In no case was the peritoneum interested and there were no intraperitoneal collections. After the tomographic diagnosis of colonic perforation, all patients were treated antibiotically with a combination of cephalosporin of generation 3 with metronizadol. Ureteral drainage was performed on all patients on the day of the diagnosis of colonic perforation.

A conservative treatment was applied to all patients. In patients with colonic fistula on the left side, healing was done without complications. In the patient

| Table 2. Evaluation of diagnosis, treatment and evolution in patients with colonic perforation | | | | |
|---|---|---|---|---|
| | Patient 1 | Patient 2 | Patient 3 | Patient 4 |
| Time until colonic injury diagnosis | >48 h | >48 h | <48 h | >48 h |
| Ureteral catheter | Yes | Yes | Yes | Yes |
| Type of applied treatment | Conservative | Conservative | Conservative right colectomy (after 4 days) | Conservative |
| Duration of postoperative hospitalization | 7 | 10 | 10 | 6 |
| Ureteral stent extraction | 6 weeks | 6 weeks | 6 weeks | 6 weeks |
| 6 weeks outcome | Successful | Successful | Successful | Successful |
| 6 months outcome | Successful | Successful | Successful | Successful |

with colonic fistula on the right side at 4 days postoperatively, surgery was required which resulted in the right colectomy.

Ureteral stent was suppressed in all patients 6 weeks after discharge.

The control at 6 weeks and at 6 months revealed a kidney without lithiasis, sterile uroculture or a sequelae of the colonic fistula. (Table 2).

## Discussion

Treatment of post PCNL colonic perforation is not standardized.

There are several factors that increase the risk of colonic perforation. The most common complications of this type appear on the left side. Hopper and collegues have demonstrated on a series of 500 CT scans that in up to 2% of cases colon is positioned retrorenally, more frequently on the left side [6].

The percutaneous approach of renal lithiasis in the case of renal malformations (horseshoe kidney or ectopic pelvic kidney) also presents an increased risk for the incidence of colonic perforation [7].

Trexer and collegues, however, showed that the most important predictive factors for colon perforation are the history of open kidney or abdominal surgery and low body mass index [8].

Other incriminating factors with an increased incidence of colonic perforation are female sex, increased renal mobility (which correlates in most cases with low body mass index), or anterior position of the calyx [3].

There is no data in the literature to prove superiority of pronation vs supine position during PCNL in term of risk of colonic perforation [9].

Early diagnosis of renal perforations increases the success rate of treatment of this complication [3].

As mentioned before, there is no standardization of the treatment of this complication. Most authors prefer a conservative approach in the first phase. It has a success rate of up to 80% if the complication is recognized early [10].

El-Nahas AR on a series of approximately 5000 patients reported a number of 15 patients with this complication post PCNL. Only 2 patients needed a colostomy, the others were treated conservatively [11].

Karchrilas S and collegues [12] and Tefleki A and collegues [13] on a series of 1620 and 811 patients respectively with PCNL reported a number of 5, respectively 3 patients with colon perforation. All were treated conservatively.

On the other hand Vallenciene G and collegues [14] and Lee WJ and collegues [15] on a series of 250, respectively 582 patients reported a number of 2, respectively 1 patient with this complication, all being treated by colostomy.

There were also reported deaths due to complications of colonic perforation [16].

## Conclusion

Colon perforation is a severe complication after PCNL. Factors favoring these complications should be recognized preoperatively and thus the risk of colonic perforation can be reduced by creating a more posterior path during renal punction. Early diagnosis of this pathology is essential for rapid recovery and without sequelae. Conservative treatment can be applied especially in cases where colonic perforation occurs following a PCNL performed on the left side.

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